CITY, UNIVERSITY OF LONDON, MSC LIBRARY SCIENCE
INM 304 DIGITAL LIBRARIES, DR. LYN ROBINSON
APRIL 2017

What is a digital library?

POSSIBILITIES FROM THE IDEA OF ‘DIGITAL OBJECT’

Mariana Strassacapa Ou

Digital libraries are difficult to define, as they are closely related to the ongoing, often overwhelming boom of Information and Communication Technologies and computing, and more specifically, to the rise of the ‘digital’: all processes still in intense activity and development. In that sense, ‘digital libraries’ are very young—authors refer to the 1990s as their first decade—and very much alive, expanding and changing by the day. As systems based on highly accessible, mutable networks, dynamism is part of their nature.

In this essay, I first take a look into some existing definitions of 'digital library', attempting to identify the continuities and changes they presented over time, and to understand the reasons why the term has always been under revision. I then recognise a great divergence between the various definitions when it comes to trying to describe what a 'digital library' is made of: 'digital documents', 'information entities', 'data'? I argue for an agreement on the idea that a 'digital library' contains 'digital objects'; I explore this term by breaking it into 'object' and 'digital' and what they might mean in the contexts of digital libraries. Defining what a 'digital object' is does not specify what a 'digital library' is, as 'digital objects' are all over digital media; however, it does shine light on often undiscussed but fundamental issues regarding the nature of digital libraries, like the meaning of 'digital', and the materiality problem of digital libraries content.

1. PAST AND PRESENT DEFINITIONS —AREN’T THEY SUFFICIENT?

When investigating the existing characterisations of ‘digital library’, one is amazed by how numerous they are; as early as the year 2000, professor of Library and Information Science Candy Schwartz wrote of ‘a multitude of definitions’ for the term, and reported that students in a library course ‘found 64 different formal and informal definitions of “digital library”’ in a class project (Schwartz, 2000). Another telling evidence that a quest for a proper clarification of ‘digital library’ has been busying researchers for decades is American professor Christine Borgman’s 1999 article *What are digital libraries? Competing visions*, in which she reports years of debate around the term between scholars and practitioners, and of efforts of researchers such as herself to establish an agreed definition of what ‘digital library’ is, as a way of advancing research on the topic (Borgman, 1999). A comprehensive, authoritative definition that stood the test of time is one that Borgman along with other scholars

came up with as a result of the 1996's *Social aspects of digital libraries* workshop, funded by the National Science Foundation:

> 1. Digital libraries are a set of electronic resources and associated technical capabilities for creating, searching and using information. In this sense they are an extension and enhancement of information storage and retrieval systems that manipulate digital data in any medium (text, images, sounds; static or dynamic images) and exist in distributed networks. The content of digital libraries includes data, metadata that describe various aspects of the data (e.g. representation, creator, owner, reproduction rights) and metadata that consist of links or relationships to other data or metadata, whether internal or external to the digital library.
> 2. Digital libraries are constructed, collected and organised, by (and for) a community of users, and their functional capabilities support the information needs and uses of that community. They are a component of communities in which individuals and groups interact with each other, using data, information and knowledge resources and systems. In this sense they are an extension, enhancement and integration of a variety of information institutions as physical places where resources are selected, collected, organised, preserved and accessed in support of a user community. These information institutions include, among others, libraries, museums, archives and schools, but digital libraries also extend and serve other community settings, including classrooms, offices, laboratories, homes and public spaces. (Borgman et al., 1996)

Academic Karen Calhoun, investigating the digital library almost two decades later, characterised this definition as 'very influential in the digital library field', and after a balance and analysis of many other previous definitions, provided her own in the book *Exploring digital libraries*:

> 1. A field of research and practice with participants from many disciplines and professions, chiefly the computer, information and library sciences; publishing; the cultural heritage sector; and education.
> 2. Systems and services, often openly available, that (a) support the advancement of knowledge and culture; (b) contain managed collections of digital content (objects or links to objects, annotations and metadata) intended to serve the needs of defined communities; (c) often use an architecture that first emerged in the computer and information science/library domain and typically features a repository, mechanisms supporting search and other services, resource identifiers, and user interfaces (human and machine). (Calhoun, 2014)

The two definitions are very similar, being Calhoun's a bit less specific so it 'can evolve as digital libraries evolve in the context of the web', and Borgman's very much up-to-date, even if it was written at times when the 'digital library' was relatively new. Having gone through various conceptualisations of 'digital library' and investigated many different digital libraries for her research, Calhoun can claim perhaps the best, most recent accurate definition available today, as it can be easily tested against digital libraries to identify them as such; see, for example, the Digital Public Library of America statement:

> The Digital Public Library of America brings together the riches of America's libraries, archives, and museums, and makes them freely available to the world. It strives to contain the full breadth of human expression, from the written word, to works of art and culture, to records of America's

> heritage, to the efforts and data of science. DPLA aims to expand this crucial realm of openly available materials, and make those riches more easily discovered and more widely usable and used, through its three main elements: (1) A *portal* that delivers students, teachers, scholars, and the public to incredible resources, wherever they may be in America; (2) A *platform* that enables new and transformative uses of our digitised cultural heritage; (3) An advocate for a strong *public option* in the twenty-first century.

In this self-description, the DPLA is expressing in other words both Borgman's and Calhoun's definitions of what a digital library is: a 'portal'—as a website—, a 'platform'—as a repository—, and a 'public option'—as accessible through the Web. The DPLA calls itself a 'digital library', but a website does not need to do so to be one; institutional websites of museums and archives, for example, have been making content available through the web by digitising material objects, providing metadata and collection details, and presenting it in an accessible, searchable way for public use—building digital libraries, then. Neither Borgman's or Calhoun's definitions leave much doubt about what should or should not be considered a 'digital library', and they seem to be in consonance with the shape and content of the digital libraries of today. *Why is it, so, that despite these quite clear, sufficient definitions, we still keep asking the question 'what is a digital library', as we have been through the last decades since its emergence, and keep reflecting about its character? Why is it 'a field of research'?*

Reasons abound, but I would like to highlight two which I think can be considered fundamental. First, as discussed above, the life of digital libraries has often been connected to the activity of the World Wide Web, meaning frequent change, unpredictability, and susceptivity to disruption; these characteristics of the digital library as a system often hosted by and accessed through the Web do require from researchers a constant work of revision of concepts and definitions, since the continual update of digital technologies directly impacts their uses —and vice versa. As Calhoun put it, 'Social roles and communities are more likely to abide over time; collections and enabling technologies are more likely to shift': when it comes to 'digital libraries', the 'library' bit of the concept is more or less clear and persistent; the 'digital' part, though, requires constant revision as it changes and evolves.

Second, we might be in a constant need to redefine the 'digital library' because the frequently emerging new definitions just never seem to *actually* settle certain concepts which are fundamental to the thorough understanding of the very theoretically complicated idea of 'digital library'. Since the 1990s we have been using words such as 'open', 'collection', and 'community' to define the digital library, but these are words that have acquired different meanings in the digital milieu and cannot be fully comprehended when simply dislocated from the definition of traditional library to the digital library. Not only known words require new characterisations, but a new, essential term also needs an urgent scrutiny, as its incredibly pervasive use disguises people's actual obliviousness: what it means *to be 'digital'*. Essentially, a digital library is 'digital' because its most fundamental element, the collection, is digital—but what does that actually mean?

2. WHAT IS THE DIGITAL LIBRARY MADE OF?
DIVERSE, LOOSE TERMS

No definition of 'digital library' so far has addressed this deeper conceptual problem, one I argue here is at the core of what a 'digital library' is, despite the overall awareness that having firm theoretical foundations matters. *What is a digital library made of?* The various available definitions provide many different answers. Borgman's definition compiled above states that the content of digital libraries includes ***data*** and ***metadata***, but in the 1996's article where the definition first appeared Borgman and coauthors also wrote that 'Digital libraries contain ***information entities*** collected and organised on behalf of communities. These *entities* are ***artefacts*** of human communication or are digital representations of artefacts. … Information entities are *data* and usually carry associated *metadata* that is necessary to identify, manage, and use the data [added emphasis]' (Borgman et al., 1996).

Data, *metadata*, *information entities*, *artefacts*… Adding to the collection of cloudy terms, Borgman also makes a distinction between *digital objects* and *digitised objects*: '…the term "digital" is problematic, for it reflects both "digital objects"—those created in digital form, and "digitised objects"—those that are representations (e.g. scanned images, keyed text) of objects in other forms' (Borgman et al., 1996). There is indeed a difference between the processes of *digitisation* (e.g. to scan a page of a book) and *datafication* (to convert into indexable data), but both result in 'digital objects'—a concept I will support here as the most adequate define the substance of the digital library. Also, today we refer to these objects which were created in digital format as 'born digital', as opposed to those that were 'digitised'; again, the result are 'digital objects' all the same.

More ideas of what a digital library is made of can be found in the various other definitions of the term. Also from 1996 is Peter Lyman's article *What Is a Digital Library? Technology, Intellectual Property, and the Public Interest*, in which the author tries to dig deeper into the idea of the digital library by investigating some concepts he believes are essential, one of them being the ***digital document*** as the content of the digital library—but he does so in terms which are also a bit outdated today, like the distinction between 'text' and 'information'; even so, his approach of departing from fundamental concepts to discuss the new meanings and challenges that digital libraries impose is compelling.

More recently, the coauthored 2007 DELOS Manifesto *Setting the Foundations of Digital Libraries* defined that a digital library is made of ***digital content***, and that this content 'is composed of a set of *information objects*'; no further problematisation of these concepts is suggested. Similarly, Calhoun talks about the digital library as a collection of '*digital content* (objects or links to objects, annotations and metadata)' (Calhoun, 2014), but does not go deep in defining what this means; also, links to objects, annotations and metadata are all *digital objects* per se, if a recent, authoritative definition of 'digital object' from the point of view of philosophy/philosophy of computer science is considered.

3. A CASE FOR 'DIGITAL OBJECTS' AS THE CONTENT OF THE DIGITAL LIBRARY

From this quick balance of some definitions of 'digital library', it seems like we have been more or less repeating what a digital library is or does, but using diverse terms to describe what its content is or what it is made of. Here I make the case for the use of the term 'digital object' to describe the content of the digital library. By doing so, I do not intend to close or narrow the debate, but to open it in various but well defined lines of investigation, as the term's complexity allows for a wide range of further inquiry. And from the examation of the depths of the 'digital object', the hope is that we might get closer to better comprehend the nature of the 'digital library'.

For a brief definition of 'digital object', I will borrow from the academic Yuk Hui's book *On the Existence of the Digital Object* (Hui, 2016), a remarkable work on philosophy with a scope that goes far beyond what is significant for our discussion here; for this essay, his introductory definition of the term will be used, as well as an insight to his philosophical approach ('The investigation presupposes a reciprocal relation between computation and philosophy') and some inquiries he suggests to explore the 'digital object'. Hui's definition cited below is used here as starting point and support from where fundamental issues of today's 'digital libraries' arise and will be discussed—in a digital library from the inside-out, conceptual approach:

> Videotapes have been replaced by YouTube videos, and dinner invitations are no longer issued through letters, less and less by telephone calls and e-mails, but more often by Facebook event invitations. These objects are basically data, sharable and controllable; they can be made visible or invisible through the configuration of the system. … By digital objects, I mean objects that take shape on a screen or hide in the back end of a computer program, composed of data and metadata regulated by structures or schemas. … in general, they constitute a new form of industrial object that pervades every aspect of our lives in this time of ubiquitous media—such as online videos, images, text files, Facebook profiles, and invitations. … They exist both on the screen, where we can interact with them, and in the back end, or inside the computer program. (Hui, 2016)

3.1 'OBJECT'—RATHER THAN 'CONTENT', 'DOCUMENTS', 'INFORMATION', OR 'DATA'—AND IMPLICATIONS

As we have seen, a variety of terms have been used to describe what digital libraries are made of; I propose the use of the concept of 'digital object' as stated above for many reasons, and one of them is because other terms are simply less adequate. Digital 'content', as most of the recent definitions put it, is a appropriately broad, unspecific idea, but it obviously does not address what that content actually is; it can be as diverse as it is elusive. A digital 'document', on the other hand, carries too heavy a specific conceptual weight to be generalised as the content of the 'digital library'; if we consider the definition of a document by function, that is, by pondering whether a certain item functions as a document (Bawden & Robinson, 2012), we stumble on the complicated question: can all items of a collection be automatically considered 'documents' just for being part of a library? To describe the content of digital libraries, we need a more general term independent of such uncertainties. Furthermore, the definition of a document as such, either 'physical' or 'digital', goes through a scrutiny of the

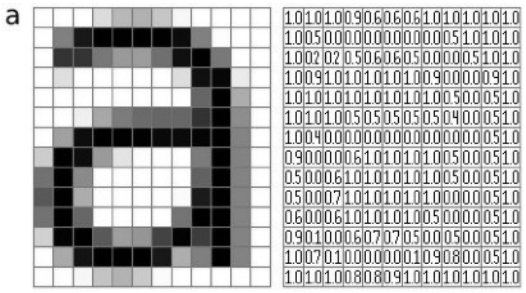
content it carries—and in digital libraries we are usually dealing with data and digits, for which semantics does not apply. As for 'information', the problem is the opposite: it is a broad concept that goes far outside the limits of digital libraries, and for which no consensus exists; debates abound on whether information is actually *all* that exists (Horgan, 2011) or 'an abstract entity, existing outside materiality as well as being a mathematical entity following the mathematical theory of communication' (Hui, 2016). And despite data being the what a digital object consists of, using only this term to describe items of a digital collection is not appropriate, as this data often takes the shape of texts, images, and sounds from the point of view of the user, who perceives them as such instead of just digits.

The term 'digital *object*', however, seems to address all these issues satisfactorily. General enough, it still admits examination from a theoretical perspective, as Hui demonstrated in his book; there is possibility of identifying it 'as subject matter of philosophy, just as the natural object and the technical object were before it' (Hui, 2016), picking up from the thoughts of Hume, Kant, Hegel, Husserl, Heidegger, and Simondon. Also, the idea of 'object' impel us to talk about matters of *existence* and *substance*—Hui asks: 'Does a digital object have substance (is it possible to talk about it in this way?)'. The question of the materiality of the digital object is a complex, essential one. The traditional library has been dealing with the materiality of paper for centuries, and the preservation and safeguard of this material has been one of its main duties; besides, the existence of a book, a photograph, or a newspaper that you can hold in your hands can hardly be questioned. The same cannot be said of the digital object in a digital library, though; as light in a screen, and more deeply, as computed data, the digital object is always a *version* (whether born-digital or digitised), as it can be copied and reproduced with perfect exactitude.

This has groundbreaking consequences for the nature of the collection: the move of the object from unquestionable physicality to digital format 'generally means a move from "ownership" and "location" to "access"' (Bawden & Robinson, 2012), meaning the most fundamental aspect of the digital object in a digital library collection is its *accessibility rather than its integrity and presence* in time and space. 'This means that such a collection can no longer be thought of as a set of physical items in a particular location, or even a collection of digital items on a particular computer, but rather a means of selecting items from the universe of knowledge' (Bawden & Robinson, 2012)—what we can understand as *curation*. The collection of digital objects chiefly chooses from a set of objects and provides maximum dissemination; the roles of preserving particular objects and providing adequate physical storage stay with the traditional library collection.

Many digital libraries present collections of digital objects created from the digitisation of printed materials, like manuscripts and film photographs; in the sense we have been discussing, it cannot claim to be preserving the object by means of digitisation, as digitisation provides a version which is easier to disseminate and access but lacks the integrity of the object. The scanner often used in these processes generate digital objects in TIFF format or some other kind of raster graphic, in a way that it can be stored in the computer memory and read later; the term 'bitmap' refers to how a given pattern of bits in a pixel maps to a specific colour (Kolas, 2005/7)—figure A

shows a bitmap version of a magnified letter ‘a’; figure B shows the beginning of a TIFF file. These figures make quite clear how a bitmap image file is basically code (or data) that requires computer processing to take the shape of an actual image on the screen.




```
address          contents
(decimal)          (hex)
     header
0                49 49
2                2A 00
4                08 00 00 00

     IFD
8                1B 00
     0th directory entry
10                 FF 00          tag=255
12                 03 00          type=3 (short)
14                 01 00 00 00    length=1
18                 01 00 00 00    value=1
     1rst directory entry
22                 00 01          tag=256
24                 03 00          type=3 (short)
26                 01 00 00 00    length=1
30                 58 02 00 00    value=600
     2nd directory entry
34                 01 01          tag=257
36                 03 00          type=3 (short)
38                 01 00 00 00    length=1
42                 5A 02 00 00    value=602
     .
     .
     .
     offset to next IFD
334                  00 00 00 00
     offset=0 so there are no more IFD's
```

figure A (above): Kolås, Ø. 2005, 2007. Raster Image. *Image Processing with gluas*. http://pippin.gimp.org Accessed 12/04/2017.
figure B (right): Phillips, D. 2000. The beginning of a TIFF file. Image Processing in C. Electronic Edition 1.0. http://homepages.inf.ed.ac.uk/rbf/BOOKS/PHILLIPS/cips2ed.pdf Accessed 12/04/2017.

The question of the (i)materiality of the digital object is very clear from these images: how can we think about the existence of a digitised image, which becomes alphanumerical code in the computer memory, and only takes the shape of its matrix when processed? Media theorist Wolfgan Ernst agrees that the digital object’s main virtue is accessibility rather than preservation: ‘The strength of digitised archivalia lies not in their (highly vulnerable) migrability into the technological future but in their substantially potentized present online accessibility. Longevity is rooted in the materiality of the archivalia—discourse in their immaterial circulation as information. … The testimonial function of archival records was once firmly rooted in their material authenticity. … With the digital, physical signals become information’. (Ernst, 2013)

The notion of *surrogate* is useful to think about the digital object here. The digitised image in the digital library refers to a matrix physical object from which codified information was generated, basically a set of rules for a computer processor to be able to recreate the image of it on the screen. Not that users actually think they are experiencing the real, so-called ‘original’ object when accessing a digitised version of it; but anyway, as academic and author Jeffrey Drouin pointed out, ‘Archives of digitised print materials do not pretend to replace the experience of the original but nonetheless promise, implicitly if not explicitly, a way of engaging with the attributes of those objects in order to facilitate scholarly judgments about them’ (Drouin, 2016). The digitised object stands in the digital library as a representation of the printed or manuscript material, a much more accessible version of its matrix, but is it just a *surrogate*, that is, a simple substitute, or should we talk about it in

terms of a *simulacrum*, as Drouin defined, as an object that 'fulfils the role of surrogate as a substitute deputed by authority yet lacks the true substance of that for which it stands'?. From what we have seen about what a Bitmap image that often figures as digital object in digital libraries is made of—alphanumerical code that definitely lacks the *substance* of its 'original'—, I would not hesitate to characterise (digitised) digital objects as *simulacra*. This is an important assertion, as it confronts the common idea of digitisation as preservation, as well as puts in question the relationship between the 'original' object and its digital form: does the digital object simply refers to the physical world; is it just the *idea* of something else?

But the independence of the digital object from its matrix is not all negative; when recreated as image on screen, a page of a book, for example, can benefit from new meanings, as its characteristic as image is enhanced and its other physical attributes like smell and texture are subtracted. 'The high-definition mimesis of digital scanning provides many more photographic possibilities. Print magazines are in this way similar to photo negatives, especially after they are translated and transcribed into a digital medium; they become metamorphosed into a different kind of art—no longer a printed text. Like a pagan animal deity, which is less than human insofar as it embodies a single characteristic, yet thereby far more powerful as a force of nature, the digital surrogate diminishes the aura of the printed original but still wields an enchantment all its own'. (Drouin, 2016) The aura might be lost in the translation to the digital, but the new nature of the resulting digital object (as long as it really is treated as *new*) allows for endless possibilities—artistic, scholarly, publishing etc.

The born-digital digital object yields a different discussion. They are not digital translations of an object outside of themselves; rather, they have always been data in the first place. Figure C shows a vector image both as command and resulting processed image: an object born out of a computer's computing. A body of text in a digital library, like a journal article on JSTOR, can also be a born-digital digital object; the problem of their existence is: if the media-machine that is capable of reading such commands cease to exist or work, will the digital object cease to exist as well, if it consists primarily of code? If we print on paper that article which was first produced in a computer, we are creating an unique physical object out of a perfectly reproducible digital object—and aren't we already living in this cycle of artefact ↔ digital object without realising? To preserve a

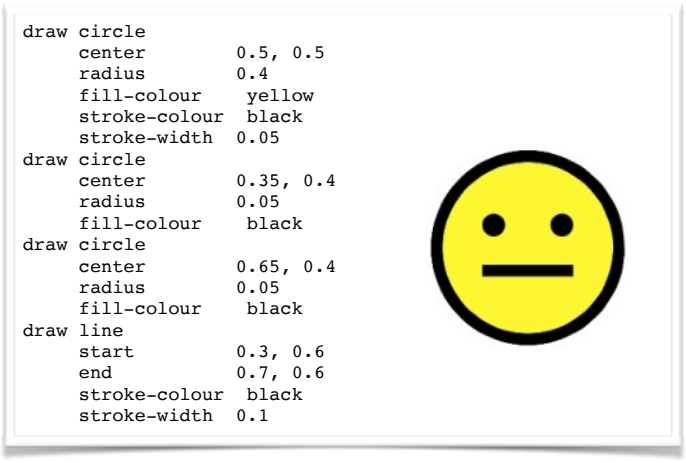


figure C: Kolås, Ø. 2005, 2007.
A vector image of a face,
and the instructions used to create the image.
Image Processing with gluas.
http://pippin.gimp.org Accessed 12/04/2017.

born-digital digital object, do we print it out and preserve it as a physical object/artefact, following the logic of 'preserve the object to preserve the document', or wouldn't it be more adequate to preserve the computer which is able to read and process the instructions that recreate the digital object, along with the instructions themselves—since, just as an artefact becomes something else when translated as a digital object, so does the digital object become artefact when transformed into a physical object, unreproducible. Hardware and software are updated with great frequency; a new version may not be capable of processing a digital object which was created with an older version, but we usually take this as a problem of technics only, and not as a broader, fundamental philosophical issue that concerns with the very existence of the objects we create and deal with in our everyday lives—and therefore with the memory of ourselves we are keeping, or not, to the future.

3.2 'DIGITAL'

The term 'digital' has a short history but an intense one in terms of language: from 'almost nothing before the 1950s to a top-2500 word' on contemporary English, it is currently applied to refer to everything that is somehow related to electronics or computer technology, like 'digital watch', 'digital divide', 'digital humanities' (Peters, 2016). However, its wide use does not reflect an understanding of its meaning. When it comes to the 'digital library' and the 'digital objects' its collection is made of, what is the meaning of the 'digital', as opposed to the traditional library? Most understand it is 'digital' because the 'digital library' is accessed through computers connected to an internetwork; I argue here it is so because it is made of 'digital objects'. In that way, not only the 'object' must be clarified, but also the 'digital'.

The principle which leads the idea of 'digital' as perceived here is one that Hui put simply, 'that digital shouldn't be understood merely in terms of ones and zeros but rather as the capacity to process data' (Hui, 2016). Digital objects we have seen above are indeed 'ones and zeros', that is, they are primarily generated from binary code, or other form of alphanumeric code, but there are digital objects which cannot be codified in this way, but are 'digital' still, like digital sounds such as MP3 files. Figure D, showing two analogue-to-digital processing methods, are great representations of the concept of 'digital'. As mentioned above, digital signal cannot be written in commands like the ones we can use to generate images on a screen; digital signal is sound signal very

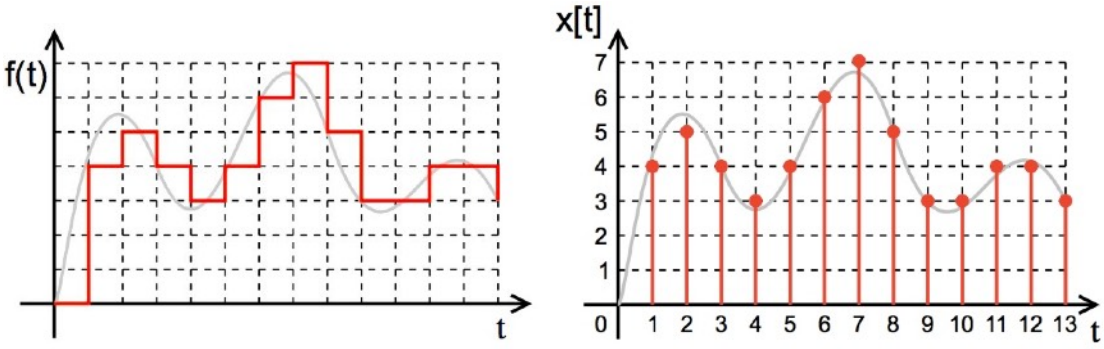


figure D: Graphic (left) showing an analogue sound wave signal (in grey) and its sampled and rounded digital signal representation (in red); Graphic (right) showing analogue (grey) and digital (red) signal, the latter being produced by sampling and presenting discrete values—4, 5, 4, 3, 4… Images are Public Domain.

much like the analogue one. But the digital signal is *quantified*; it is analogue signal processed in a way that creates values from a discrete, finite set. By doing so, losses and imprecise generalisations will necessarily occur.

This is all quite well understood, and is in consonance with the central issue of information science as explained by Claude Shannon and others: that all real signals can be reduced into digital symbols, with losses (Peters, 2016). Contemporary academics of digital media like Benjamin Peters and Yuk Hui are not denying this principle; what they are trying to say, by expanding the definition of 'digital', is that it does much more than 'just' 'reduce into digital symbols'; for Peters, 'like fingers, digital media carry out at least three fundamental categories of actions: digits count the symbolic, they index the real, and, once combined and coordinated, they manipulate the social imaginary' (Peters, 2016). In that sense, we have been using 'digital language' just as long as we have been using our fingers, or our index fingers—since *ever*. As a way to deal, manage, and make sense of the real, digital processing of the world has been known to us for a very long time; what is undeniably new is the speed and measure with which our computer machines can help us do it today. 'It is hard to overlook the ascendance of this one—but only one—kind of fundamental work our digits do: counting, at scales so large and steps so sophisticated that we name the qualitative change in counting *computing*' (Peters, 2016).

As as we can see from the graphs depicting the analogue and the digital signal: yes, the digital signal is a lossy translation into definite, more manageable symbols, but both the analogue and the digital are ways of referring to something in the real world outside of themselves, sound waves (pressure and time) in this case. The 'analogue' and the 'digital' are processes that are not opposed to each other, as we usually understand; in fact, they are much more closely related than we first perceive. As Jonathan Sterne argues in his article that explores the concept of 'analogue', 'analogue denotes a specific technical process, where one quality is used to represent another. … the entire world outside digital processing is not analogue, because analogue represents a particular technocultural relationship to nature. Nature may well be conceived as having analogues within it, but it cannot be analogue.' (Sterne, 2016). The term starts to be understood as anything that is not-digital after the 1970s, and expanded to become an umbrella term for the whole reality outside computing, generalising 'the "not-digital" definition to cover a host of practices that once had nothing to do with digital technologies' (Sterne, 2016).

There are many consequences for digital libraries and their digital objects if we think about the 'digital' and the 'analogue' from this broader—or narrower?—perspective. We should remember that analogue representations of images and sounds were once taken as overmechanical and artificial, while today they are perceived as organic and even 'artisanal', like photography and recorded music; when we free these artefacts from the burden of this idea of 'analogue' as the unique object immaculate from the 'digital', we are able to deal with digitisation processes with more ease, and perhaps more creativity; 'restoring some specificity to the term [analogue] will help stimulate our technological imaginations' (Sterne, 2016). The digital object could then be seen less as an evil, analogue-killer of the technoculture we live, and more as another possibility of representing and thinking about the world. A change in the idea of what a digital library is should then follow.

What we already know is the power of *datafication*. As historian Abby Smith Rumsey remarked, 'The value we get from scanning is far greater than digital access alone. We have discovered that a book, manuscript, map, or painting with one value in artifactual form can have multiple novel values when converted into data' (Rumsey, 2016). Indeed, whole new fields of inquiry emerged from the ability provided by digital libraries to process, index, manipulate, and compare digital objects; 'culturomics' investigates behaviour and cultural trends through the quantitative analysis of texts, and Google uses datafied text from millions of scanned books to improve its machine translator (Mayer-Schönberger & Cukier, 2013). The consequences of precise computing proliferate; but a more complex understanding of 'digital'—and 'analogue'—can unleash also new interpretations of other binaries that are currently unexplored in the world of digital libraries, like form/content, real/symbolic, material/immaterial (Sterne, 2016).

CONCLUSION

In this reflective essay, I have tried to expand the concept of 'digital library' by suggesting numerous inquiries from the idea of 'digital object'.

A brief examination of the many existing definitions of 'digital libraries' showed that the social function of the 'digital library' has been quite well understood and agreed upon: it is mainly about access, dissemination, democratisation—virtues related to the Web, which is the most common platform of digital libraries. Also, the idea of the digital library as an 'enhanced traditional library' in terms of capacity for storage, indexing, searching, and retrieving is also clear. However, no consistence was found with regards of what a digital library is made of. The term 'digital content' seems obviously correct, but does not reveal what this content actually is. If a traditional library contains a collection of books (and other documents, but chiefly books, unless it expresses itself differently; e.g. a 'music library' will contain a number of sound recordings), then a digital library contains a collection of…? I made a case for the use of the term 'digital objects' to refer to the content of a digital library, first because I found no agreed term in the existing definitions, and second because the more specificity we provide to terms, vocabulary, and language we use, the more we can advance in the knowledge of a field. Bawden & Rowlands summarised this issue with accuracy: 'There is little agreement on the basic assumptions underlying the concept of the digital library, to judge from the literature of the subject. Nor is there general agreement about the meaning of some of the most essential terminology, even "digital" itself. This is not merely a problem of academic hair-splitting; it affects the ability of funding agencies, researchers and practitioners to reach a common understanding of aims and objectives, and hence compromises the successful future development of library services' (Bawden & Rowlands, 1999).

A development of the concept of 'digital object' does not entirely solve the question 'what is a digital library?', nor was the intention that it did; here, it worked more as a way of diving into the idea of digital library, as it is my perception that the investigation the term has been shallow conceptually, with the exception of a few attempts to

complicate the discussion (Rowlands & Bawden, 1999); most studies on digital libraries acknowledge the complexity of the term 'digital', for example, but do not engage in inquiries. This essay attempted to demonstrate what a deeper conceptual analysis could be like and enable in terms of questions.

The problem of 'what is a digital library', I believe, was well solved by Calhoun, who recently provided a very good definition based on extensive research; my only alteration to it would be to replace the term 'digital content' with 'digital objects'. But there is still some anxiety around the question 'is *this* a digital library?', as so many websites and applications now feature some kind of collection. To answer that, I recommend going through the three elements of a 'digital library' in Calhoun's definition and measure the potential-digital library against them. For example, 'is JSTOR a digital library?'—I would say yes, as it aims the advancement of knowledge and features a managed collection of digital objects in an accessible platform, where they are indexed and searchable; the fact that the access to its content is paid is not in conflict with the idea that it serves a community. 'Is Tinder, the dating app, a digital library?'—I see no reason why it would be, as its primary goal is *not* the advancement of knowledge. 'Is Google Books a digital library?'—This one is a bit trickier; even though we can claim that the digital objects in their collection do help the advancement of knowledge, there is no actual way of proving that this is the *primary* goal of the platform, as it is privately owned by a big tech company with its own objectives; also, the management of their collection is a concealed, unaccessible, and private matter. But the fact that we may be left with doubts about whether a certain portal is a digital library does not mean that Calhoun's isn't a good definition; despite the fact that traditional libraries exist for millennia, we still struggle to decide if certain so-called libraries actually are so, or what are the very essential defining elements of a library. These doubts keep the debate alive, and that is fine.

Digital libraries are a powerful evidence of the of the ever more unquestionable, intrinsic association between Library and Information Science. It is expected that a disruption of concepts and practices occur when our tools of work change—when librarians start dealing mainly with data instead of paper. But it is of fundamental importance that we keep rethinking these new concepts and practices as not to let them escape our control and alienate us within the digital milieu; on this matter, Hui appropriately cites Simondon: 'The stronger cause of alienation in the contamporary world resides in this misunderstanding of machine, which is not an alienation caused by machines, but the lack of understanding of its nature and its essence, because of its absence from the world of significations and its omission in the table of values and concepts belonging to culture.'

And a final consideration: The Web is not a (digital) library, as it lacks the library's rules of access and privacy (Rumsey, 2016); lots of web content we consume daily as information is privately created and managed, and the conditions for its use are often concealed or detrimental for the individual's rights and privacy. Peters remind us (Peters, 2016): 'the broader the spread of digital media, the more powerfully certain humans will be able to represent and reshape reality itself. In fact digital computation renders more and more of the world visible to

those with the tools to compute, index, and manipulate data. … Digital techniques let those in privileged positions symbolically construct models of the world that index and manipulate it'.

Maybe we should all become literate digital librarians.

REFERENCES

Bawden, D. & Robinson, L., PhD, 2012. *Introduction to information science*. Facet: London.

Bawden, D. and Rowlands I. 1999. Digital libraries: assumptions and concepts. *Libri* 49(4): 181-191.

Borgman, C. L., Bates, M. J., Cloonan, M. V., Efthimiadis, E. N., Gilliland-Swetland, A., Kafai, Y., Leazer, G. L., Maddox, A. 1996, *Social aspects of digital libraries. Final report to the National Science Foundation.* https://works.bepress.com/borgman/183/ Accessed 13/04/2017

Borgman, C.L. 1999, "What are digital libraries? Competing visions", *Information Processing & Management,* vol. 35, no. 3, pp. 227.

Calhoun, K. 2014, *Exploring digital libraries: foundations, practice, prospects*, Facet, London.

Drouin, J. 2016. Surrogate. In book Peters, B. (ed.) *Digital Keywords: A Vocabulary of Information Society and Culture*. Princeton University: Princeton.

Ernst, W. 2013. *Digital memory and the archive*. Eletronic mediations, Volume 39. University of Minnesota Press: Minneapolis, London.

Hui, Y. 2016. *On the existence of digital objects.* Electronic mediations, Volume 48. University of Minnesota Press: Minneapolis, London.

Lyman, P. 1996, "What Is a Digital Library? Technology, Intellectual Property, and the Public Interest", *Daedalus,* vol. 125, no. 4, pp. 1-33.

Mayer-Schönberger, V. & Cukier, K. 2013. *Big data: a revolution that will transform how we live, work and think.* John Murray: London.

Nyhan, J., Flinn, A., SpringerLink (Online service) & SpringerOpen 2016, *Computation and the Humanities: Towards an Oral History of Digital Humanities*, Imprint: Springer, Cham.

Peters, B. 2016. Digital. In book *Digital Keywords: A Vocabulary of Information Society and Culture*. Princeton University: Princeton.

Rowlands, I. & Bawden, D. 1999. *Understanding digital libraries: towards a conceptual framework*. British Library R&I Report No 170.

Rumsey, A. S. 2016. When we are no more: how digital memory is shaping our future. Bloomsbury Press: London.

Schwartz, C. 2000, "Digital libraries: an overview", *The Journal of Academic Librarianship,* vol. 26, no. 6, pp. 385-393.

Sterne, J. 2016. Analogue. In book Peters, B. (ed.) *Digital Keywords: A Vocabulary of Information Society and Culture*. Princeton University: Princeton.